User Guide for

FEBFDMQ86530L

Evaluation Board

GreenBridge™ of High-Efficiency Bridge Rectifiers Quad N-Channel PowerTrench® MOSFETS

Featured Fairchild Product:

FDMQ86530L

Direct questions or comments about this evaluation board to: "Worldwide Direct Support"

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This user guide supports the evaluation kit for the FDMQ86530L. It should be used in conjunction with the FDMQ86530L datasheet as well as Fairchild's application notes and technical support team. Please visit Fairchild's website at www.fairchildsemi.com.

This document describes the evaluation kit for the GreenBridge™ FDMQ86530L integrated quad 60 V N-channel MOSFET in an MLP 4.5 x 5 package. The FDMQ86530L replaces a conventional diode bridge in AC 24 V rectifier applications by reducing the power dissipation and reducing thermal problems.

1. Evaluation Board Specifications

- Board laminate: FR-360HR
- Cu layer count: 4-layer
- Board thickness: 1.6 mm
- Inter layer Cu thickness: 2 oz.
- Via hole minimum plating: 20 µm
- Outer layer Cu thickness: 2 oz.
- Solder mask is concentric with holes per standard specification
- Gold immersion
- Non-conductive ink silkscreen

Table 1. Summary of Features and Performance

Parameter	Value	Remark
GreenBridge™	FDMQ86530L	Quad 60 V N-channel PowerTrench® MOSFETs, Fairchild Semiconductor
Controller	Bridge Controller	
V_{IN} Range	9 V_{AC} ~ 42 V_{AC}	
Switching Frequency	60 Hz	
Max. I_{OUT}	5 A	Limited by Power component

Table 2. MOSFET Parameters

Part Number	Location	BV_{DSS} (V)	I_D T_A=25°C	Typ. $R_{DS(ON)}$ at 10 V_{GS}	Typ. Q_g at 10 V_{GS}
FDMQ86530L	Q1, Q2, Q3, Q4	60	8 A	12 mΩ	23 nC

The board dimensions are 100 mm x 75 mm. Figure 1 shows the physical information of the individual layers.

		1.6T
Copper	1	0.07
Pre-preg		0.18
Copper	2	0.07
C.C.L		1.0
Copper	3	0.07
Pre-Preg		0.18
Copper	4	0.07
	Total Thickness	1.64T

Figure 1. Board Construction

2. Photographs

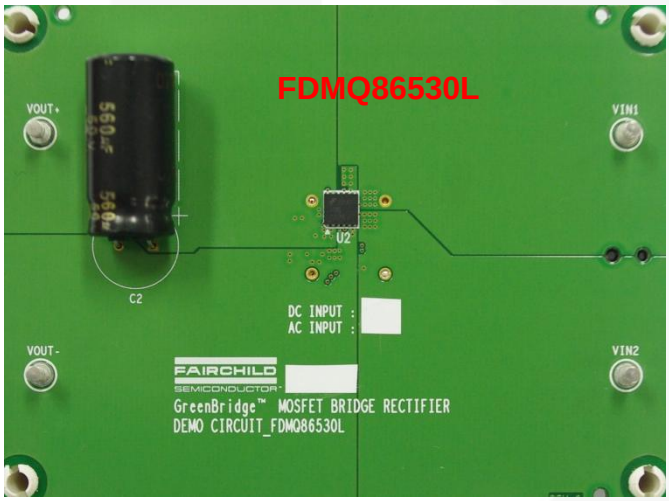

Figure 2. Top View

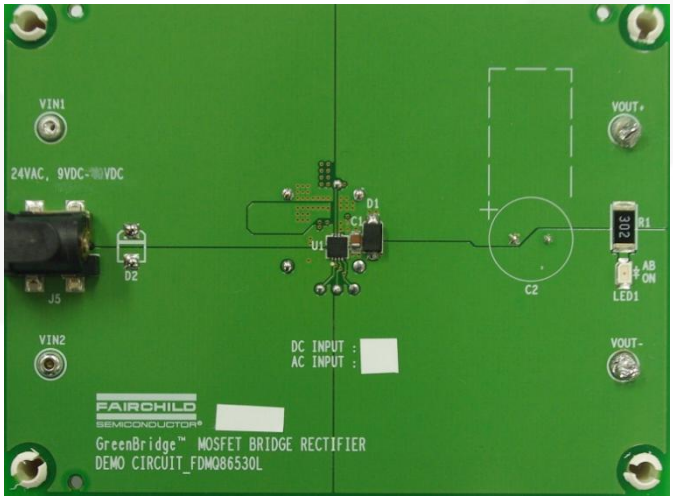

Figure 3. Bottom View

3. Printed Circuit Board

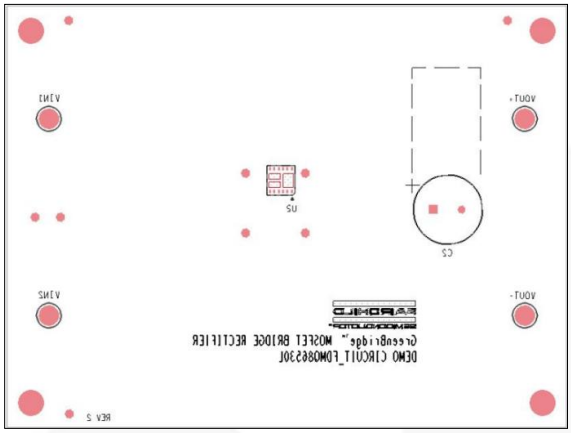

Figure 4. SST and SMT Top Side (Size = 100 X 75 mm, 4 Layer)

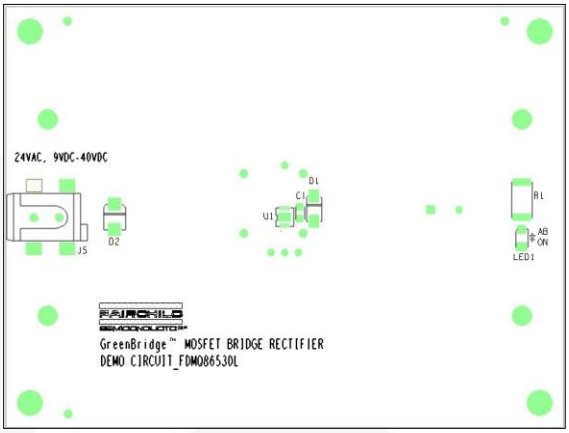

Figure 5. SSB and SMB Bottom Side

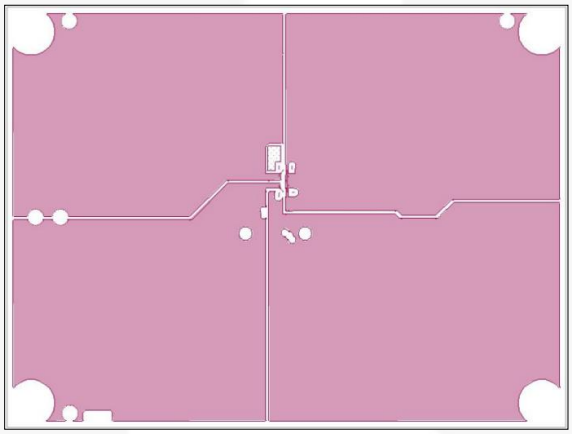

Figure 6. Top Layer

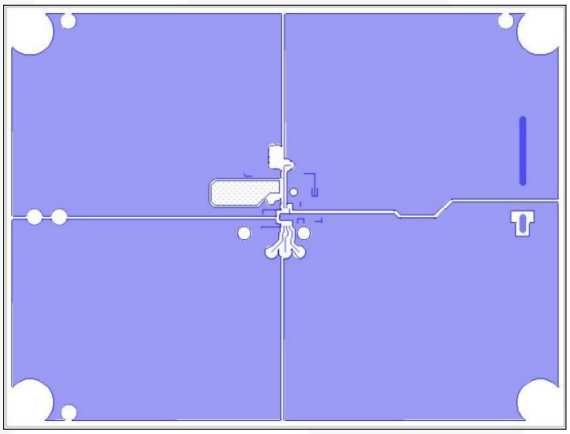

Figure 7. Bottom Layer

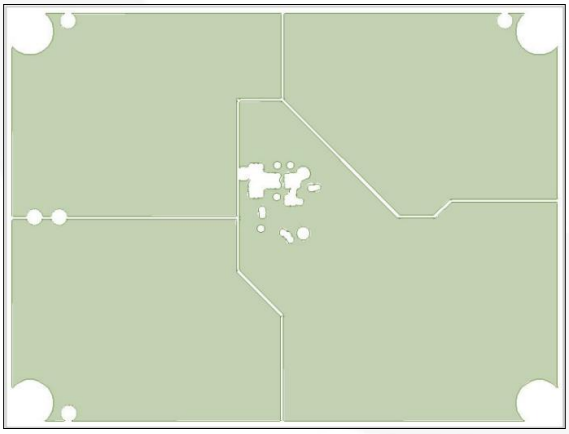

Figure 8. Power Layer

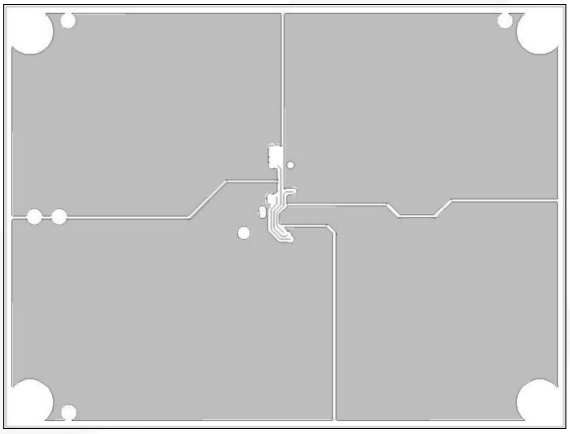

Figure 9. Ground Layer

4. Schematic

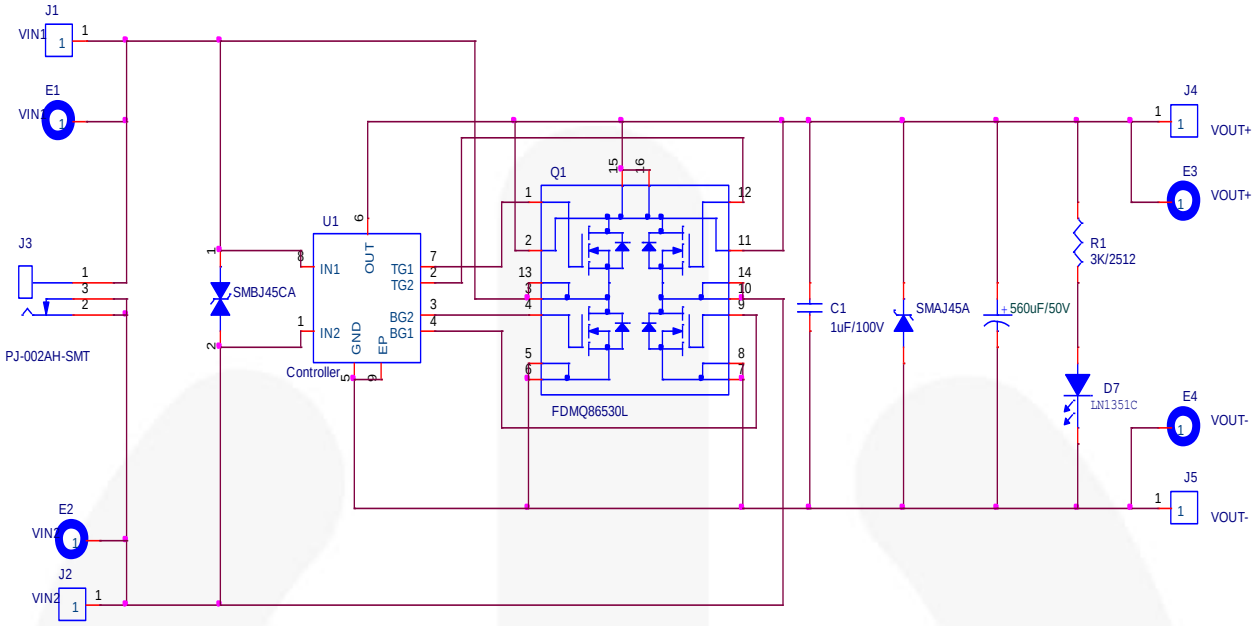

Figure 10. Evaluation Board Schematic

5. Bill of Materials

Item	Qty.	Reference	Part Name	Vendor	Comment
1	1	C1	C2012X7S2A105K	TDK	1 µF / 100 V / 2012
2	1	C2	EEU-FM1H561	Panasonic	560 µF / 50 V /ALU
3	1	D1	SMAJ45A-13-F	Diodes	TVS UNIDIRECT 400 W 45 V SMA
4	1	D2	SMBJ45CA-13-F	Diodes	TVS BIDIRECT 600 W 45 V SMB
5	4	E1-E4	2501-2-00-80-00-00-07-0	Mill-Max	Test Pin
6	1	J5	PJ-002A-SMT	CUI INC.	POWER JACK 2.1 x 5.5 mm
7	1	LED1	LN1351CTR	Panasonic	GREEN J-TYPE SMD
8	1	R1	CRCW25123K00JNEG	VISHAY	3 kΩ, 5% 2512
9	1	U1	LT4320IDDE	LINEAR TECH.	IC
10	1	U2	FDMQ86530L	Fairchild Semiconductor	60 V N-Channel MOSFET GreenBridge™
11	4	MH1-MH4	8833 (SNAP ON)	KEYSTONE	NYLON 0.50" Tall

6. Test Setup

6.1. Test Equipment

- 0 – 50V_{AC} / 5 A AC power supply for input voltage
- Oscilloscope to view waveforms

6.2. Test Setup

- AC V_{IN} power supply adjusted and connected toVIN1 (J1) and VIN2 (J2)

Figure 11. AC GreenBridge™ FDMQ86530L Test Setup

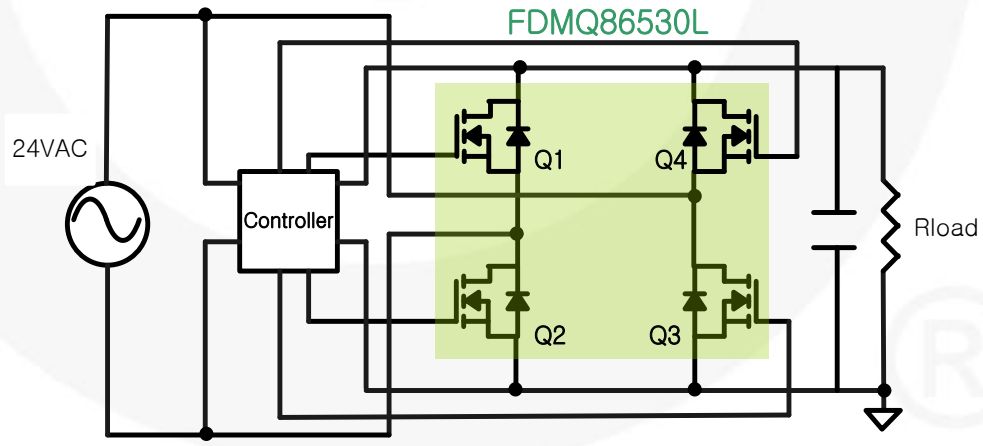

Figure 12. Test Diagram

7. Measured Data

Figure 13 - Figure 15 show the measured thermal performance of the GreenBridge™ FDMQ8650L compared with B360B diode bridge on the evaluation board. Figure 16 shows the thermal image at 5 A of output current.

Table 3. Test Condition

V_{IN}	f_{SW}	I_{OUT}	Cooling
24 V_{AC}	60 Hz	0~5 A, 0.5 A Step, 5 min. Soak Time	No

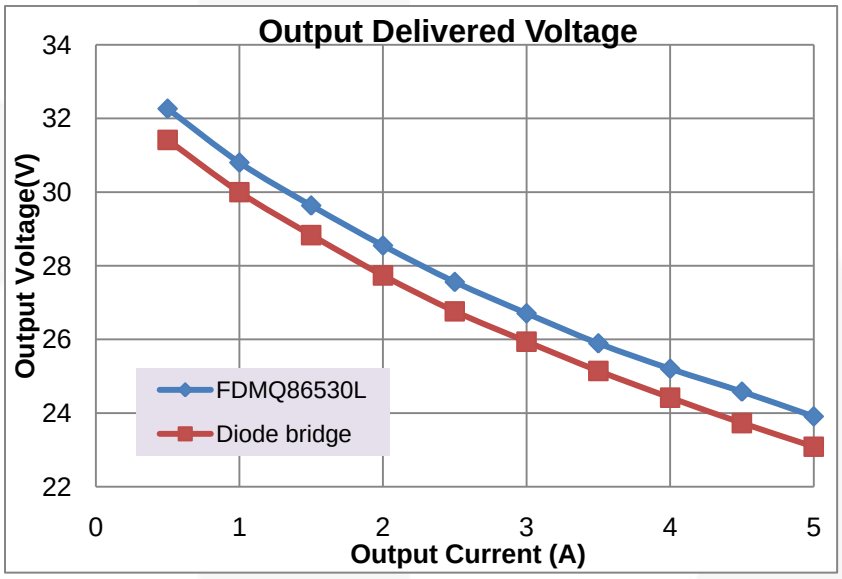

Figure 13. Output Delivered Voltage at T_A=25°C, Natural Air Flow

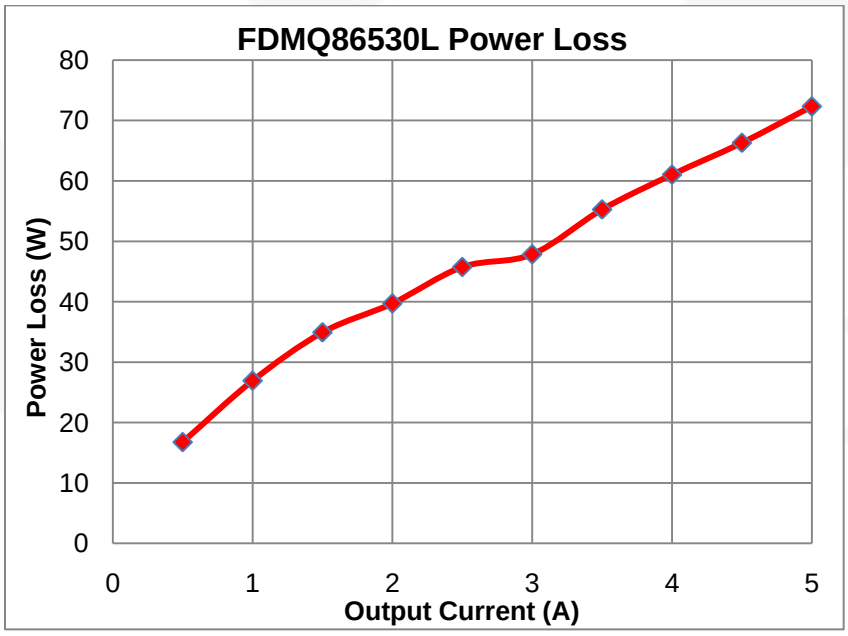

Figure 14. Power Dissipation at T_A=25°C, Natural Air Flow

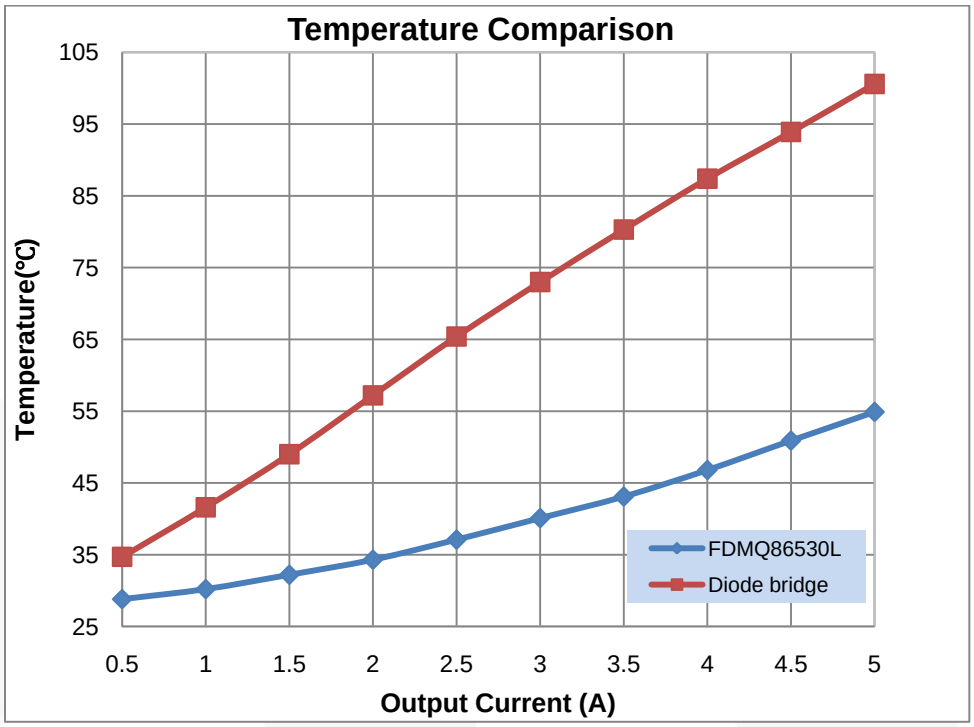

Figure 15. Thermal Performance at T_A=25°C, Natural Air Flow

7.1. Thermal Images

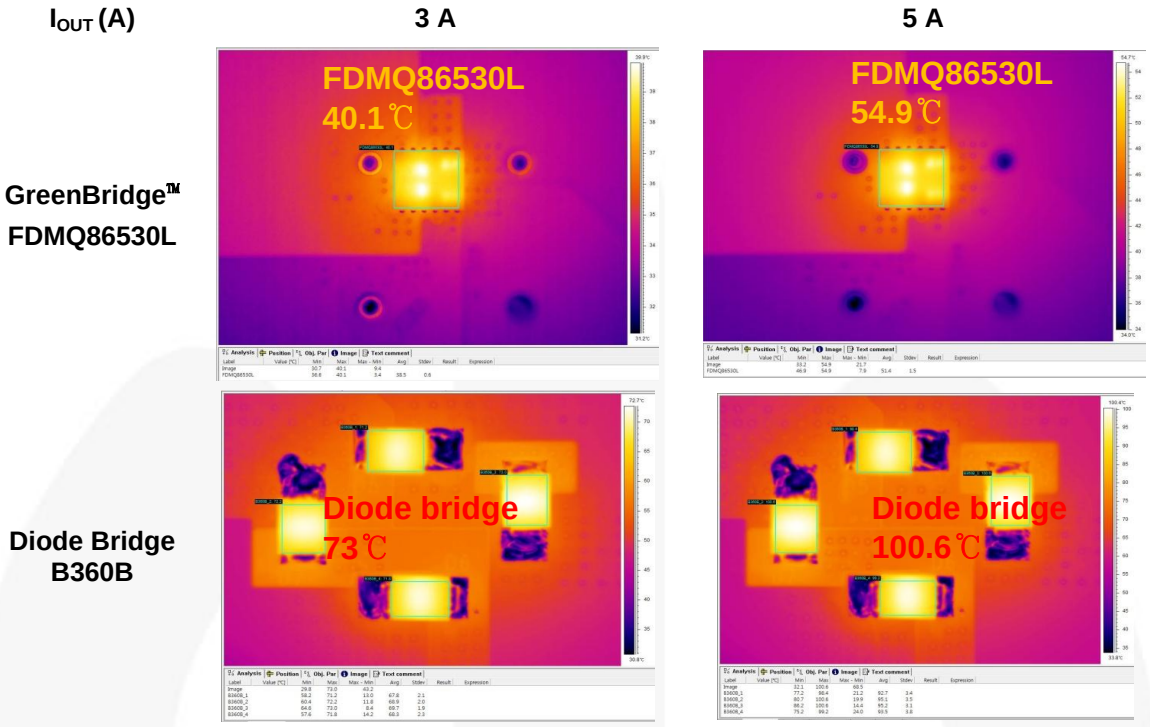

Figure 16. Thermal Performance at V_{IN} = 24 V_{AC} / 60Hz, T_A=25°C, Natural Air Flow

7.2. Waveforms

I_{OUT} = 3 A
I_{OUT} = 5 A
FDMQ86530L V_{OUT} 10 V / div
FDMQ86530L I_{IN} 7 A / div
FDMQ86530L V_{GS_top} 5 V / div
FDMQ86530L V_{DS_bottom} 5 V / div
FDMQ86530L V_{OUT} 10 V / div
FDMQ86530L I_{IN} 7 A / div
FDMQ86530L V_{GS_top} 5 V / div
FDMQ86530L V_{DS_bottom} 5 V / div

Figure 17. Switching Waveforms at V_{IN} = 24 V_{AC} / 60 Hz, T_A=25°C, Natural Air Flow

8. Revision History

Rev.	Date	Description
1.0.0	October 2013	Initial Release

WARNING AND DISCLAIMER

Replace components on the Evaluation Board only with those parts shown on the parts list (or Bill of Materials) in the Users' Guide. Contact an authorized Fairchild representative with any questions.

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